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Summer 2014

CI 505 Final Project

This project would be used in a high school environmental science class.

Project Goals:

* Investigate the effects of agricultural runoff.
* Design a product that could be placed in or around fields to help reduce the amount of runoff leaving fields.
* Develop an informative presentation on agricultural runoff to share with the public.

Scenario:

As most people know, the world’s population continues to increase. With an increase in population comes the need for more resources and food to be produced. As it so happens, we are in a state that plays a huge role in producing food now and will continue to play a role into the future. Iowa’s climate is ideal for growing crops and producing livestock. Iowa ranks first in the United States in corn and soybean production and Iowa pork producers raise about 28% of all U.S. pork products (Iowa Farm Bureau). According to the Iowa Farm Bureau, most of Iowa’s corn and soybeans are used to produce other food products or as feed for livestock.

With the high demand for quality crops, many farmers use fertilizers and pesticides in their fields in order to ensure they are able to produce high yields. The practice of over applying chemicals to fields has created problems with Iowa’s water supply. Over application of chemicals has many other adverse impacts on the environment, but for our purposes right now we will focus on water quality. According to the United States Environmental Protection Agency, Iowa has the worst water quality in the nation. Not all farmers are a part of the problem; most farmers are very responsible with what they put on their fields. However, some farmers and large corporate farms drastically overuse fertilizers and pesticides on their crops. Along with the overuse of chemicals in farm fields comes the issue of agricultural runoff. Many of these chemicals are washing out of fields and into Iowa’s waterways. One major nutrient that is causing a problem in the water supply is nitrogen. The city of Des Moines, Iowa has the largest nitrogen removal plant in the world in order to deal with this issue (U.S. EPA).

The EPA has seen enough and wants to see drastic changes occurring in Iowa in regards to agricultural runoff and water quality. The EPA has contacted Iowa Secretary of Agriculture Bill Northey to address the issue immediately. However, Secretary Northey is very busy with his re-election campaign right now and has asked our class to step in and help.

Secretary Northey has asked our class to:

* Create an informative interactive presentation to share with the public on the impacts of overuse of chemicals in farm fields. Secretary Northey has requested that the presentation contain visuals and incorporate the impacts on others outside the state of Iowa (For example, nutrients running down the Mississippi river and creating a dead zone which can affect fishing operations in the Gulf).
  + Possible actions include researching information and creating a visual presentation or photo essay in Google presentations, Animoto, Prezi, Layar, etc.
  + Other possible actions include creating a program that informs farmers on the impacts of overusing chemicals on their fields in a Scratch program that could be distributed to farmers through local Iowa State extension offices.
* Develop a mechanism that could be placed in fields or around waterways that would reduce the amount of chemicals entering Iowa’s waterways.
  + Possible actions include using Sketchup to create a model of a mechanism that could eventually be exported and printed on a 3D printer. The model could then be used as a guide for eventual production of the mechanism and in informative presentations to farmers on how to effectively use the mechanism to reduce runoff pollution from Iowa’s farm fields.

Sources:

Iowa Farm Bureau. (2014). Ag Facts. Retrieved June 12, 2014, from http://www.iowafarmbureau.com/public/167/ag-in-your-life/ag-facts

United States Environmental Protection Agency. (2014). Iowa Drinking Water. Retrieved June 12, 2014, from http://water.epa.gov/drink/local/ia.cfm

TPACK Plan:

1. Learning Goals:

Iowa Core Science Standards Addressed:

* Understand and demonstrate knowledge of the social and personal implications of environmental issues.
* Understand and apply knowledge of environmental stewardship.
* Understand and apply knowledge of ways to help take care of the environment.
* Communicate and defend scientific procedures and explanations.

2. Eight Practical Pedagogical Decisions:

* More Student Centered
* Part Convergent, Part Divergent (Mostly divergent)
* Fewer Prior Experiences (Some students might have prior experience)
* Surface Comprehension with Concepts and Skills that require Deep Knowledge
* Longer Duration Plan
* Less Structured Learning
* Small Group
* Multiple Additional Resources Required

3. Activity Types:

* Researching information and creating a visual presentation or photo essay in Google presentations, Animoto, Prezi, Layar, etc.
* Creating a program that informs farmers on the impacts of overusing chemicals on their fields in a Scratch program that could be distributed to farmers through local Iowa State extension offices.
* Using Sketchup to create a model of a mechanism that could eventually be exported and printed on a 3D printer. The model could then be used as a guide for eventual production of the mechanism and in informative presentations to farmers on how to effectively use the mechanism to reduce runoff pollution from Iowa’s farm fields.

4. Assessment Strategies:

* Constant informal assessment throughout the unit in which the teacher would be actively moving around the room asking questions and redirecting students when necessary.
* Rubrics would be created addressing specific criteria for the three different group projects to be assessed when they are completed.
* Rubrics would also be created to assess the group presentation to the class when the projects are completed.

5. Tools and Resources:

* Individual student laptops with Internet access
* Google Drive
* Animoto
* Prezi
* Layar
* Other presentation media
* Scratch
* Sketchup
* 3D Printer (If available)
* Projector or smart board for presentations